OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **STOCKER POND** the program coordinators recommend the following actions.

We would like to encourage the association to conduct more in-lake sampling events in the future. With a limited amount of data it is difficult to determine water quality trends. Since weather patterns and activity in the watershed can change throughout the summer it is a good idea to sample the lake several times over the course of the season.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *slightly improving* in-lake chlorophyll-a trend, meaning concentrations are decreasing. Chlorophyll concentrations were consistent with those of the 1998 season, and stayed below the NH mean reference line. The algae observed in the sample this year are common to New Hampshire's lakes and ponds. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *variable* trend in lake transparency. Water clarity was the same as that seen in the 1998 season, and remains below the New Hampshire mean. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *slightly improving* trend in the upper water layer, and a *fairly stable* trend in the lower water layer. Epilimnetic phosphorus concentrations decreased this season and were the lowest ever recorded for Stocker Pond! Hypolimnetic phosphorus concentrations increased from last season, however the turbidity of the sample was slightly elevated. The elevated turbidity likely was the cause of the sample being contaminated with bottom sediment. The sediment normally has phosphorus bound to it and therefore can raise phosphorus concentrations. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- Conductivity in the Inlet decreased this year (Table 6). Conductivity was particularly low this year, most likely as a result of the excess rains, which tend to dilute and remove pollutants from the surface waters. Conductivity increases often indicate the influence of human activities on surface waters. This decrease is a positive sign for Stocker Pond. Septic system leachate, agricultural runoff, iron deposits, and road runoff can each influence conductivity readings.

- In March, a sample was collected in the Inlet upstream, due to construction of I-89 that residents feared would impact the pond. The conductivity was high (777 µMhos), as was the turbidity (19760 NTU). The Inlet was not sampled again, to our knowledge, until July. The conductivity at that time was much lower. Residents were concerned that silt may have entered the pond via the Inlet during the construction. We would like to examine the area of the pond where the Inlet enters during our visit next summer.

- Phosphorus concentrations remained low this season, and were quite similar to those seen in 1999 (Table 8). With the return of rainfall this summer, phosphorus levels could have increased due to watershed runoff, however this was not the case. It is likely that the excess rains diluted the waters. We are pleased to report that phosphorus concentrations remained at levels observed during last summer's drought conditions.

- Dissolved oxygen was again depleted in the last meter of the lake in July, and was approaching the critical level of 1.0 mg/L two meters off the bottom (Table 9). The process of decomposition in the sediments depletes dissolved oxygen on the bottom of thermally stratified lakes. As bacteria break down organic matter, they deplete oxygen in the water. When oxygen gets below 1 mg/L, phosphorus normally bound up in the sediments may be released into the water column, a process that is referred to as *internal loading*. Depleted oxygen in the hypolimnion usually occurs as the summer progresses. This explains the higher phosphorus in the hypolimnion (lower water layer) versus the epilimnion (upper layer). Since an internal source of phosphorus to the lake is present, limiting or eliminating external phosphorus sources in the lake's watershed is even more important for lake protection.

- *E. coli* originates in the intestines of warm-blooded animals (including humans) and is an indicator of associated and potentially harmful pathogens. Bacteria concentrations were low at all the sites tested; however, they were slightly elevated in the Inlet in July (Table 12). The July results were still well below the state standard of 406 counts per 100 mL. The Inlet flows from a wetland area. Animals that are found in wetland areas, such as beaver, muskrat, and waterfowl, can add influence bacteria concentrations. Bacteria thrive in warm, stagnant waters and can cause slightly elevated results when flushed downstream. If residents are concerned about septic system impacts, testing when the water table is high or after rains is best. Please consult the Other Monitoring Parameters section of the report for the current standards for *E. coli* in surface waters.

NOTES

- Biologist's Note (7/18/00): Construction on 89. Silt dams had rocks washed away. Water was high at the retaining pond; pump was present. Retaining pond had series of silt dams running along the backside of it. Hundreds of tadpoles in the retaining pond. Monitors concerned with accumulation of bottom sediment in the pond.

- Biologist's Note (8/4/00): *E. coli* readings vary from LSPA/DES. Called to verify numbers.

USEFUL RESOURCES

Soil Erosion and Sediment Control on Construction Sites, WD-WEB-12, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

What Can You Do To Prevent Soil Erosion?, WD-BB-30, NHDES Fact Sheet. (603) 271-3503 or www.state.nh.us

The Wetlands Resource, WD-WB-7, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Save Our Streams Handbook for Wetlands Conservation and Sustainability. (800) BUG-IWLA, or visit www.iwla.org

Bacteria in Surface Waters, WD-BB-14, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

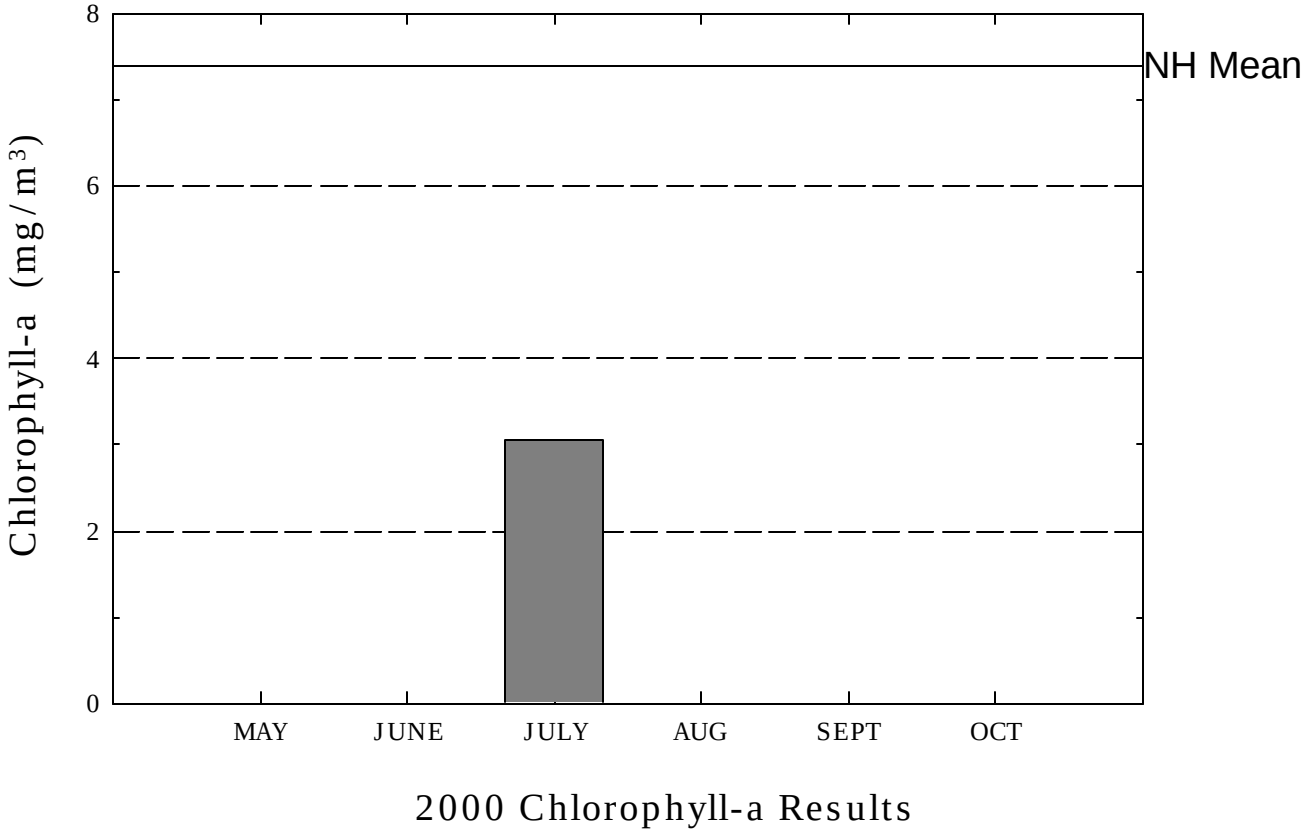
Nonpoint Source Pollution and Stormwater Fact Sheet Package. Terrene Institute. (800) 726-5253, or www.terrene.org

*Low Impact Boatin*g, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

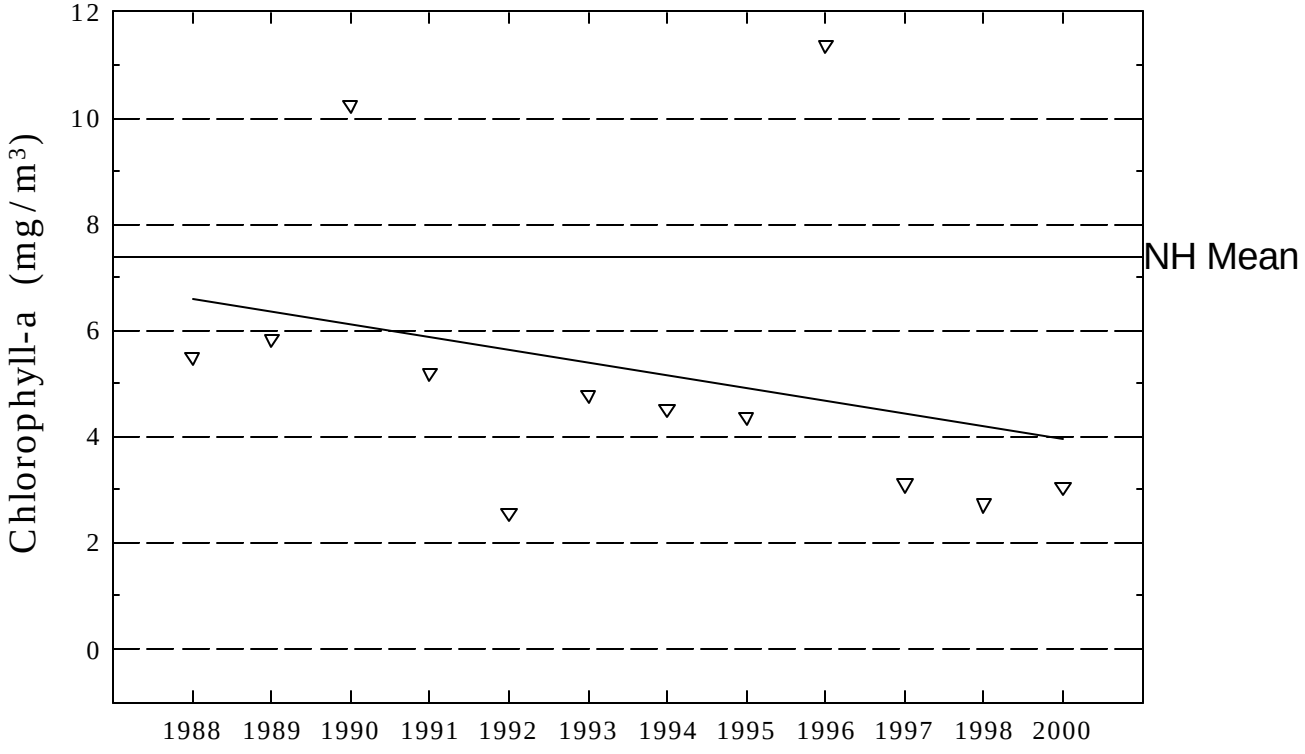
A Boater's Guide to Cleaner Water, NHDES pamphlet, (603) 271-3503 or www.state.nh.us

Stocker Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



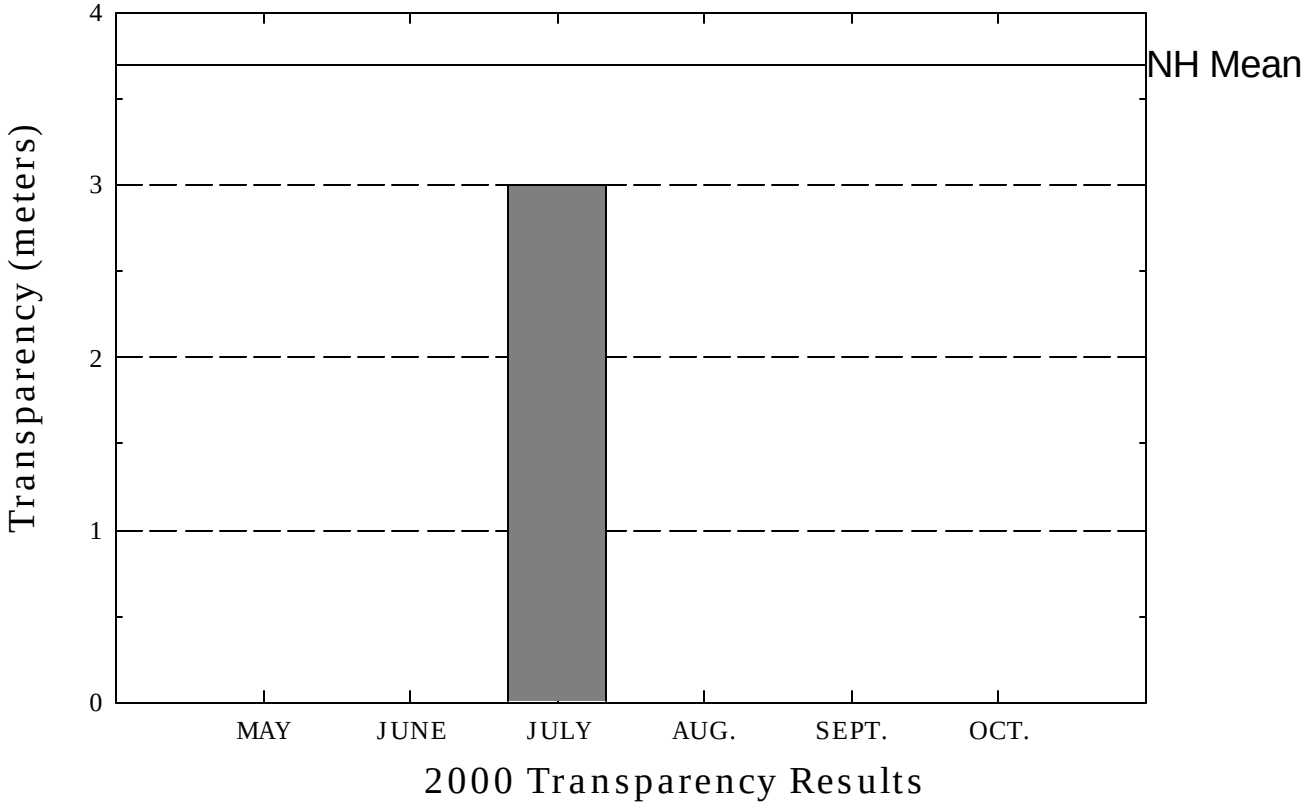
2000 Chlorophyll-a Results

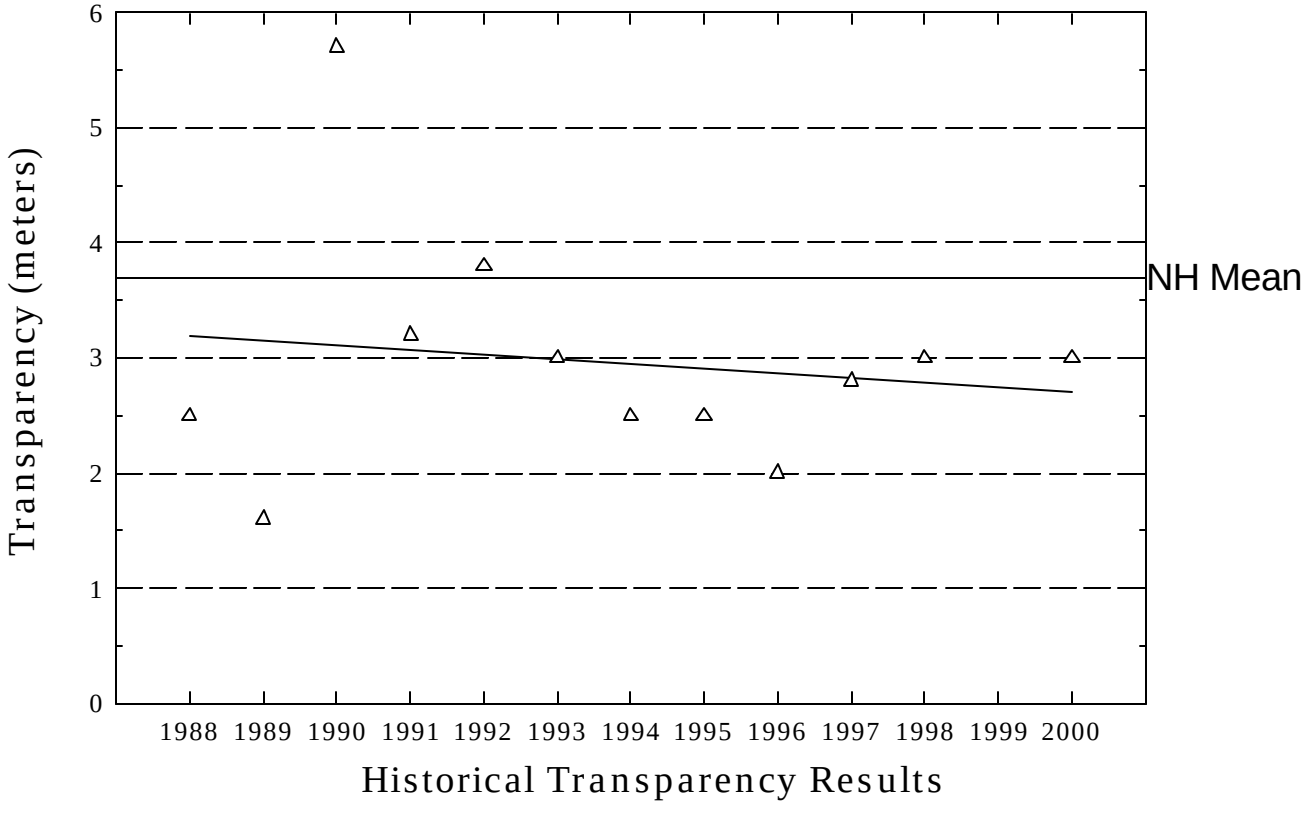


Historical Chlorophyll-a Results

Stocker Pond

Figure 2. Monthly and Historical Transparency Results





Stocker Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

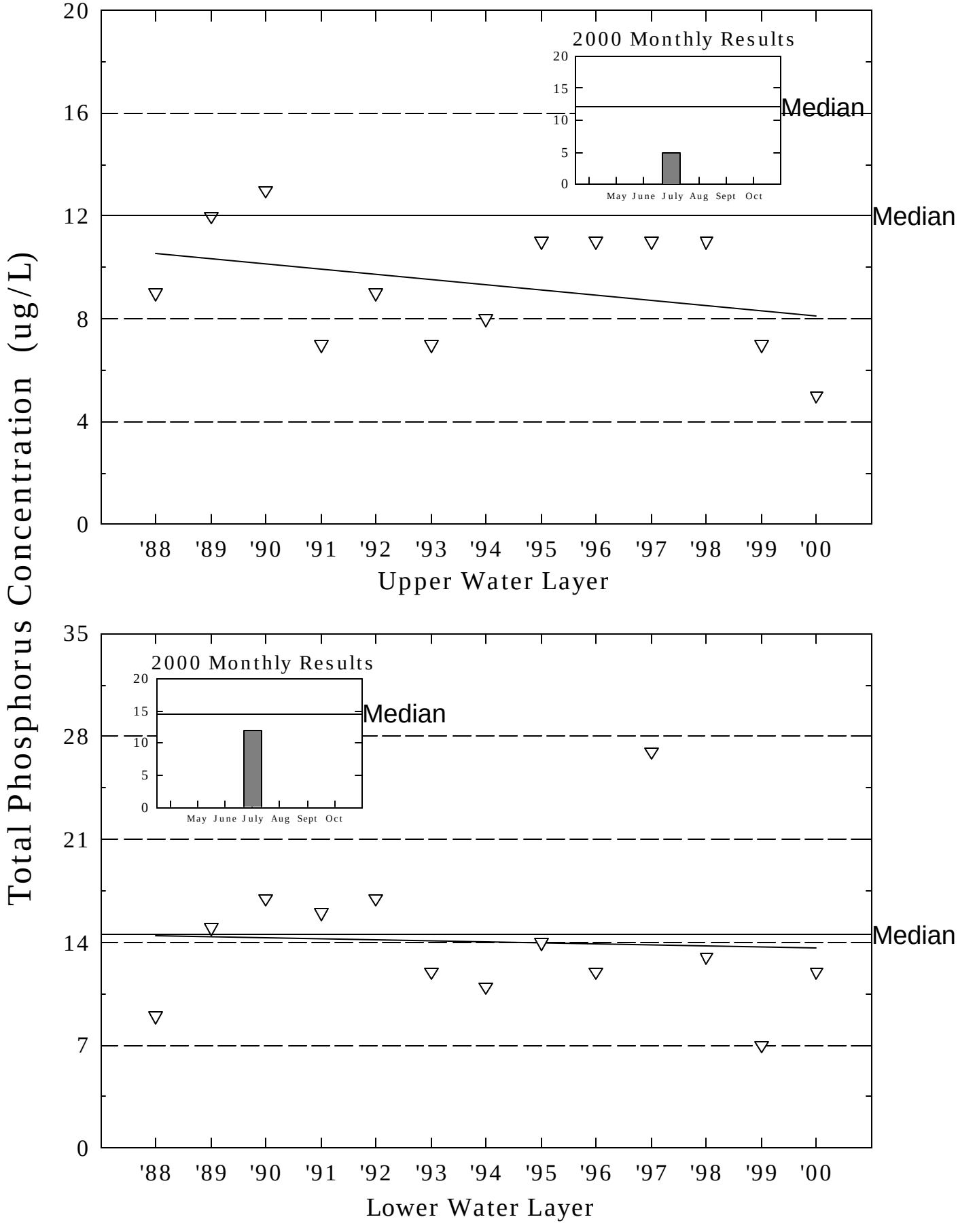


Table 1.

STOCKER POND
GRANTHAM

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1988	5.51	5.51	5.51
1989	5.83	5.83	5.83
1990	10.24	10.24	10.24
1991	5.20	5.20	5.20
1992	2.56	2.56	2.56
1993	4.79	4.79	4.79
1994	4.53	4.53	4.53
1995	4.38	4.38	4.38
1996	11.38	11.38	11.38
1997	3.11	3.11	3.11
1998	2.73	2.73	2.73
1999	4.22	4.22	4.22
2000	3.06	3.06	3.06

Table 2.

STOCKER POND

GRANTHAM

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
09/05/1988	CHRYSOSPHAERELLA	74
08/14/1989	MELOSIRA	35
	CHRYSOSPHAERELLA	
	SYNEADA	
08/28/1990	DINOBRYON	85
08/16/1991	MELOSIRA	72
	CERATIUM	11
	ASTERIONELLA	8
08/25/1992	ASTERIONELLA	52
	DINOBRYON	34
	CERATIUM	8
08/09/1993	DINOBRYON	67
08/23/1994	ASTERIONELLA	74
	CERATIUM	24
08/25/1995	SYNURA	39
	MALLOMONAS	23
	MELOSIRA	10
08/14/1996	DINOBRYON	28
	SYNURA	17
	ASTERIONELLA	14
08/11/1997	DINOBRYON	34
	CHRYSOSPHAERELLA	27
	MELOSIRA	15
08/14/1998	CERATIUM	70
	DINOBRYON	8
	TABELLARIA	7

Table 2.

STOCKER POND

GRANTHAM

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07/16/1999	CHRYSOSPHAERELLA	57
	RHIZOSOLENIA	18
	MELOSIRA	12
07/18/2000	CERATIUM	38
	DINOBRYON	24
	CHRYSOSPHAERELLA	20

Table 3.

STOCKER POND

GRANTHAM

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1988	2.5	2.5	2.5
1989	1.6	1.6	1.6
1990	5.7	5.7	5.7
1991	3.2	3.2	3.2
1992	3.8	3.8	3.8
1993	3.0	3.0	3.0
1994	2.5	2.5	2.5
1995	2.5	2.5	2.5
1996	2.0	2.0	2.0
1997	2.8	2.8	2.8
1998	3.0	3.0	3.0
1999	2.5	3.0	2.7
2000	3.0	3.0	3.0

Table 4.

STOCKER POND

GRANTHAM

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1988	6.84	6.84	6.84
	1989	6.99	6.99	6.99
	1990	6.91	6.91	6.91
	1991	7.30	7.30	7.30
	1992	7.16	7.16	7.16
	1993	7.21	7.21	7.21
	1994	6.95	6.95	6.95
	1995	6.93	6.93	6.93
	1996	6.88	6.88	6.88
	1997	7.10	7.10	7.10
	1998	7.01	7.01	7.01
	1999	7.22	7.22	7.22
	2000	6.84	6.84	6.84
HYPOLIMNION				
	1988	6.65	6.65	6.65
	1989	6.36	6.36	6.36
	1990	6.41	6.41	6.41
	1991	6.60	6.60	6.60
	1992	6.67	6.67	6.67
	1993	6.65	6.65	6.65
	1994	6.74	6.74	6.74
	1995	6.76	6.76	6.76
	1996	6.30	6.30	6.30
	1997	6.51	6.51	6.51
	1998	6.44	6.44	6.44
	1999	6.85	6.85	6.85
	2000	6.44	6.44	6.44

Table 4.

STOCKER POND

GRANTHAM

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
INLET UPSTREAM				
	1998	6.82	6.82	6.82
	2000	6.15	6.15	6.15
INLET				
	1988	6.24	6.24	6.24
	1989	6.13	6.13	6.13
	1990	6.56	6.56	6.56
	1991	7.10	7.10	7.10
	1992	6.47	6.47	6.47
	1993	6.25	6.25	6.25
	1994	6.66	6.66	6.66
	1995	6.40	6.40	6.40
	1996	6.27	6.27	6.27
	1997	6.43	6.43	6.43
	1998	6.43	6.53	6.48
	1999	6.25	6.47	6.35
	2000	6.42	6.47	6.44
OUTLET				
	1988	6.18	6.18	6.18
	1989	6.96	6.96	6.96
	1990	6.97	6.97	6.97
	1991	7.10	7.10	7.10
	1992	7.08	7.08	7.08
	1993	6.87	6.87	6.87
	1994	6.76	6.76	6.76
	1995	6.27	6.27	6.27
	1996	6.62	6.62	6.62

Table 4.

STOCKER POND

GRANTHAM

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1997	6.84	6.84	6.84
	1998	7.03	7.03	7.03
	1999	6.67	7.23	6.87
	2000	6.90	6.98	6.94

Table 5.

STOCKER POND

GRANTHAM

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1988	13.30	13.30	13.30
1989	12.80	12.80	12.80
1990	9.60	9.60	9.60
1991	12.20	12.20	12.20
1992	12.20	12.20	12.20
1993	8.20	8.20	8.20
1994	13.20	13.20	13.20
1995	15.70	15.70	15.70
1996	11.20	11.20	11.20
1997	13.10	13.10	13.10
1998	12.80	12.80	12.80
1999	13.30	13.30	13.30
2000	12.10	12.10	12.10

Table 6.

STOCKER POND
GRANTHAM

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1988	129.7	129.7	129.7
	1989	130.5	130.5	130.5
	1990	105.6	105.6	105.6
	1991	142.7	142.7	142.7
	1992	141.7	141.7	141.7
	1993	157.1	157.1	157.1
	1994	143.2	143.2	143.2
	1995	149.7	149.7	149.7
	1996	110.7	110.7	110.7
	1997	144.0	144.0	144.0
	1998	137.4	137.4	137.4
	1999	167.1	167.1	167.1
	2000	146.8	146.8	146.8
HYPOLIMNION				
	1988	130.4	130.4	130.4
	1989	139.9	139.9	139.9
	1990	110.5	110.5	110.5
	1991	145.5	145.5	145.5
	1992	143.2	143.2	143.2
	1993	159.5	159.5	159.5
	1994	143.8	143.8	143.8
	1995	152.0	152.0	152.0
	1996	125.7	125.7	125.7
	1997	151.9	151.9	151.9
	1998	150.5	150.5	150.5
	1999	166.9	166.9	166.9

Table 6.

STOCKER POND
GRANTHAM

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	2000	144.9	144.9	144.9
INLET UPSTREAM				
	1998	139.0	139.0	139.0
	2000	777.0	777.0	777.0
INLET				
	1988	143.6	143.6	143.6
	1989	125.0	125.0	125.0
	1990	98.1	98.1	98.1
	1991	147.0	147.0	147.0
	1992	187.4	187.4	187.4
	1993	183.7	183.7	183.7
	1994	142.5	142.5	142.5
	1995	181.4	181.4	181.4
	1996	182.5	182.5	182.5
	1997	185.0	185.0	185.0
	1998	170.8	213.0	191.9
	1999	147.0	209.5	178.2
	2000	138.4	149.6	144.0
OUTLET				
	1988	129.3	129.3	129.3
	1989	128.9	128.9	128.9
	1990	104.7	104.7	104.7
	1991	144.0	144.0	144.0
	1992	143.0	143.0	143.0
	1993	156.0	156.0	156.0
	1994	129.5	129.5	129.5
	1995	157.1	157.1	157.1

Table 6.

STOCKER POND
GRANTHAM

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1996	112.5	112.5	112.5
	1997	143.5	143.5	143.5
	1998	136.9	136.9	136.9
	1999	139.0	172.1	155.5
	2000	142.0	145.6	143.8

Table 8.

STOCKER POND

GRANTHAM

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1988	9	9	9
	1989	12	12	12
	1990	13	13	13
	1991	7	7	7
	1992	9	9	9
	1993	7	7	7
	1994	8	8	8
	1995	11	11	11
	1996	11	11	11
	1997	11	11	11
	1998	11	11	11
	1999	7	7	7
	2000	5	5	5
HYPOLIMNION				
	1988	9	9	9
	1989	15	15	15
	1990	17	17	17
	1991	16	16	16
	1992	17	17	17
	1993	12	12	12
	1994	11	11	11
	1995	14	14	14
	1996	12	12	12
	1997	27	27	27
	1998	13	13	13
	1999	7	7	7

Table 8.

STOCKER POND

GRANTHAM

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	2000	12	12	12
INLET UPSTREAM				
	1998	28	28	28
	2000	0	0	0
INLET				
	1988	10	10	10
	1989	12	12	12
	1990	11	11	11
	1991	4	4	4
	1992	8	8	8
	1993	7	7	7
	1994	9	9	9
	1995	7	7	7
	1996	7	7	7
	1997	16	16	16
	1998	9	11	10
	1999	4	6	5
	2000	7	9	8
OUTLET				
	1988	8	8	8
	1989	6	6	6
	1990	12	12	12
	1991	5	5	5
	1992	10	10	10
	1993	8	8	8
	1994	10	10	10
	1995	11	11	11

Table 8.

STOCKER POND

GRANTHAM

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1996	12	12	12
	1997	8	8	8
	1998	6	6	6
	1999	5	8	6
	2000	5	6	5

Table 9.

STOCKER POND

GRANTHAM

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		July 18, 2000	
0.1	22.2	8.0	92.2
1.0	22.2	8.1	92.5
2.0	22.0	8.0	91.9
3.0	21.9	7.9	90.5
4.0	18.9	1.2	12.8
5.0	18.1	0.2	2.4

Table 10.

STOCKER POND

GRANTHAM

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
August 14, 1989	5.0	16.0	1.8	18.0
August 28, 1990	5.5	17.1	-0.5	-5.2
August 16, 1991	5.5	20.8	0.2	2.2
August 9, 1993	5.0	20.0	0.5	5.0
August 23, 1994	6.0	19.7	4.5	48.0
August 25, 1995	6.0	18.0	0.8	8.0
August 14, 1996	5.0	15.9	0.4	4.0
August 11, 1997	5.0	18.8	0.2	2.0
August 14, 1998	4.5	17.2	0.3	3.0
July 16, 1999	5.0	20.2	0.6	6.8
July 18, 2000	5.0	18.1	0.2	2.4

Table 11.

STOCKER POND
GRANTHAM

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	0.9	0.9	0.9
	1998	0.5	0.5	0.5
	1999	0.7	0.7	0.7
	2000	0.5	0.5	0.5
HYPOLIMNION				
	1997	11.9	11.9	11.9
	1998	2.2	2.2	2.2
	1999	1.3	1.3	1.3
	2000	3.3	3.3	3.3
INLET UPSTREAM				
	1998	5.3	5.3	5.3
	2000	**.*	**.*	**.*
INLET				
	1997	1.5	1.5	1.5
	1998	0.7	0.8	0.7
	1999	0.9	1.5	1.2
	2000	0.7	0.9	0.8
OUTLET				
	1997	0.6	0.6	0.6
	1998	0.4	0.4	0.4
	1999	0.7	1.8	1.2
	2000	0.6	1.7	1.1

Table 12.

STOCKER POND

GRANTHAM

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	Date	E. Coli See Note Below
INLET ON TOWN LINE		
	August 4	27
INLET		
	May 31	16
	July 18	105
	August 4	27
OUTLET OF PLAZZI		
	August 4	1
OUTLET		
	May 31	0
	July 18	23
	August 4	3
PIPE UNDER 89		
	August 4	15

NOTE: "<" means "less than" and ">" means "greater than"